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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/914,306	07/16/2002	Young Suk Lee	5204-22	2394

7590 11/20/2003

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EXAMINER

CROWELL, ANNA M

ART UNIT PAPER NUMBER

1763

DATE MAILED: 11/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/914,306	LEE ET AL	
	Examiner	Art Unit	
	Michelle Crowell	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
3. Claim 2 recites the limitation "said opening" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 1 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Hijikata et al. (U.S. 5,254,214).

Referring to Figure 4, column 4, lined 13-48, and column 5, lines 33-37, Hijikata et al. discloses a semiconductor manufacturing apparatus comprising a chamber 202 having a gas inlet 204 (col. 4, lines 18-20) and a gas outlet 212 (col.4, lines 40-44), the chamber having an upper

part with a dome configuration (col. 4, line 14); a susceptor 209 provided in the chamber to permit a wafer to be placed thereon (col. 4, lines 63-67); a non-mesh plasma electrode 206 to which RF power 205 is applied to generate a plasma within the chamber (col. 4, lines 20-23); wherein the plasma electrode is of a truncated dome shape to cover the upper part. Additionally, Hijikata et al. discloses applying an RF power of about 500W to 1000W to the plasma electrode (col.3, line 10, col.6, line 17).

With respect to claim 7, the inner diameter of the electrode gradually becomes smaller from the bottom of the electrode toward the top of thereof (see attached Fig.4).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikata et al. (U.S. 5,254,214).

The teachings of Hijikata et al. have been discussed above.

Hijikata et al. fails to teach the opening having a width of about 70mm to 300mm.

The apparatus of Hijikata et al. provides an opening in the upper polar part of the dome electrode and where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device.

6. Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikata et al. (U.S. 5,254,214) in view of Takagi et al (U.S. 4,539,068).

The teachings of Hijikata et al. have been discussed above.

Hijikata et al. fails to teach the gases SiH_4 and NH_3 to form a Si_xN_y thin film having a uniform thickness.

Referring to Figure 3 and column 3, line 64-column 4, line 21, Takagi et al. teaches that it is known to provide a hydrogen containing plasma gases made of SiH_4 and NH_3 to form a silicon nitride film (Si_xN_y thin film) having a uniform thickness. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the process chamber of Hijikata et al. with the claimed gases as taught by Takagi et al. since these are known gases used to form silicon nitride thin films.

7. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikata et al. in view of Ong et al. (U.S. 5,645,900).

The teachings of Hijikata et al. have been discussed above.

Hijikata et al. fails to teach gases CH_4 and H_2 to form a DLC thin film, and SiH_4 , CH_4 , and H_2 to form a SiC thin film.

Referring to column 6, line 35 – column 7, line 6, and line 30 and 47, Ong et al. teaches that it is known to provide a hydrogen containing plasma gases made of CH_4 and H_2 to form a DLC thin film and to mix SiH_4 , CH_4 , and H_2 to form a SiC thin film having uniform thickness. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the process chamber of Hijikata et al. with claimed gases as taught by Ong et al. since these are known gases used to form a DLC thin film and a SiC thin film.

6. Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikata et al. (U.S. 5,254,214) in view of Salimian et al. (U.S. 5,716,485).

Referring to Figure 4, column 4, lined 13-48, and column 5, lines 33-37, Hijikata et al. discloses a semiconductor manufacturing apparatus comprising a chamber 202 having a gas inlet 204 (col. 4, lines 18-20) and a gas outlet 212 (col.4, lines 40-44), the chamber having an upper part with a dome configuration (col. 4, line 14); a susceptor 209 provided in the chamber to permit a wafer to be placed thereon (col. 4, lines 63-67); a non-mesh plasma electrode 206 to which RF power 205 is applied to generate a plasma within the chamber (col. 4, lines 20-23); wherein the plasma electrode is of a dome shape to cover the upper part. Additionally, Hijikata

et al. discloses applying an RF power of about 500W to 1000W to the plasma electrode (col.3, line 10, col.6, line 17).

Hijikata et al. fails to specifically teach that the plasma electrode is of a truncated dome shape.

Referring to Figures 8 and 16 and column 4, line 46-column 6, line 63, Salimian et al. teaches an apparatus wherein the plasma electrode 90 is of a truncated dome shape in order to control the uniformity of the processing across the wafer (col. 5, line 65-col. 6, line 3, col. 6, lines 48-63, col. 7, lines 36-40). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the electrode of Hijikata et al. with a truncated dome shape as taught by Salimian et al. since this would control the uniformity of the processing across the wafer.

With respect to claim 7, Hijikata et al. discloses that the inner diameter of the electrode gradually becomes smaller from the bottom of the electrode toward the top of thereof (see attached Fig.4).

7. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikata et al. (U.S. 5,254,214) in view of Salimian et al. (U.S. 5,716,485).

The teachings of Hijikata et al. in view of Salimian et al. have been discussed above.

Hijikata et al. in view of Salimian et al. fail to teach the opening having a width of about 70mm to 300mm.

The apparatus of Hijikata et al. in view of Salimian et al. provides an opening in the upper polar part of the dome electrode and where the only difference between the prior art and

the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device.

8. Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikata et al. (U.S. 5,254,214) in view of Salimian et al. (U.S. 5,716,485) as applied to claims 1 and 7 above, and further in view of Takagi et al. (U.S. 4,539,068).

The teachings of Hijikata et al. in view of Salimian et al. have been discussed above.

Hijikata et al. in view of Salimian et al. fail to teach the gases SiH_4 and NH_3 to form a Si_xN_y thin film having a uniform thickness.

Referring to Figure 3 and column 3, line 64-column 4, line 21, Takagi et al. teaches that it is known to provide a hydrogen containing plasma gases made of SiH_4 and NH_3 to form a silicon nitride film (Si_xN_y thin film) having a uniform thickness. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the process chamber of Hijikata et al. in view of Salimian et al. with the claimed gases as taught by Takagi et al. since these are known gases used to form silicon nitride thin films.

9. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hijikata et al. (U.S. 5,254,214) in view of Salimian et al. (U.S. 5,716,485) as applied to claims 1 and 7 above, and further in view of Ong et al. (U.S. 5,645,900).

The teachings of Hijikata et al. in view of Salimian et al. have been discussed above.

Hijikata et al. in view of Salimian et al. fail to teach gases CH_4 and H_2 to form a DLC thin film, and SiH_4 , CH_4 , and H_2 to form a SiC thin film.

Referring to column 6, line 35 – column 7, line 6, and line 30 and 47, Ong et al. teaches that it is known to provide a hydrogen containing plasma gases made of CH_4 and H_2 to form a DLC thin film and to mix SiH_4 , CH_4 , and H_2 to form a SiC thin film having uniform thickness. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the process chamber of Hijikata et al. in view of Salimian et al. with claimed gases as taught by Ong et al. since these are known gases used to form a DLC thin film and a SiC thin film.

10. Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (U.S. 6,287,981) in view of Salimian et al. (U.S. 5,716,485).

Referring to Figure 8 and column 6, lines 24-52, Kim discloses a semiconductor manufacturing apparatus comprising a chamber 120 having a gas inlet 130 and a gas outlet 128, the chamber having an upper part with a dome configuration (col.6, lines 26-27); a susceptor 124 provided in the chamber to permit a wafer to be placed thereon (col.6, lines 35-37); a non-mesh plasma electrode 123 to which RF power is applied to generate a plasma within the chamber; wherein the plasma electrode has a dome configuration to cover the upper part.

Kim et al. fails to teach a plasma electrode with a truncated dome shape.

Referring to Figures 8 and 16 and column 4, line 46-column 6, line 63, Salimian et al. teaches an apparatus wherein the plasma electrode 90 is of a truncated dome shape in order to control the uniformity of the processing across the wafer (col. 5, line 65-col. 6, line 3, col. 6,

lines 48-63, col. 7, lines 36-40). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the electrode of Kim et al. with a truncated dome shape as taught by Salimian et al. since this would control the uniformity of the processing across the wafer.

With respect to claim 7, the apparatus of Kim et al. discloses that the inner diameter of the electrode gradually becomes smaller from the bottom of the electrode toward the top of thereof (Fig. 8).

11. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (U.S. 6,287,981) in view of Salimian et al. (U.S. 5,716,485) as applied to claims 1 and 7 above, and further in view of Collins et al. (U.S. 6,077,384).

Referring to Figure 58 and column 33, lines 36-38, column 35, lines 23-45, and column 39, lines 4-7, Collins et al. teaches a semiconductor manufacturing apparatus having a plasma electrode 1020 (col. 33, lines 36-38) with an opening in the upper polar part of the electrode. This opening supplies gases to the wafer center in order to enhance processing uniformity (col. 35, lines 23-45). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the truncated dome electrode of Kim et al. in view of Salimian et al. with an opening as taught by Collins et al. in order to enhance processing uniformity. Additionally, with respect to the opening has a width of about 70 mm to 300 mm, the apparatus of Kim et al. in view of Salimian et al. and Collins et al. provides an opening in the truncated dome shaped electrode and where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative

dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device.

9. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (U.S. 6,287,981) in view of Salimian et al. (U.S. 5,716,485) as applied to claims 1 and 7 above, and further in view of Pang et al. (U.S. 6,193,802), Takagi et al. (U.S. 4,539,068), and Ong et al. (U.S. 5,645,900).

The teachings of Kim et al. in view of Salimian et al. have been discussed above.

Kim et al. in view of Salimian et al. fails to teach an RF power of 500 W to 1000 W.

Referring to column 13, lines 1-13, Pang et al. teaches that it is known to provide an RF power supply 102 at a power level of between 500-1000 W to plasma electrode 58. The power level must be high enough to form intense plasma and low enough to save energy costs. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the electrode of Kim et al. in view of Salimian et al. with the power level between 500-1000 W as taught by Pang et al. since this would provide a power level high enough to form intense plasma for processing.

Kim et al. in view of Salimian et al. fails to teach the gases SiH_4 and NH_3 to form a Si_xN_y thin film having a uniform thickness.

Referring to Figure 3 and column 3, line 64-column 4, line 21, Takagi et al. teaches that it is known to provide a hydrogen containing plasma gases made of SiH_4 and NH_3 to form a silicon nitride film (Si_xN_y thin film) having a uniform thickness. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the process chamber of Kim

et al. in view of Salimian et al. with the claimed gases as taught by Takagi et al. since these are known gases used to form silicon nitride thin films.

Kim et al. in view of Salimian et al. fails to teach gases CH_4 and H_2 to form a DLC thin film, and SiH_4 , CH_4 , and H_2 to form a SiC thin film.

Referring to column 6, line 35 – column 7, line 6, and line 30 and 47, Ong et al. teaches that it is known to provide a hydrogen containing plasma gases made of CH_4 and H_2 to form a DLC thin film and to mix SiH_4 , CH_4 , and H_2 to form a SiC thin film having uniform thickness. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the process chamber of Kim et al. in view of Salimian et al. with the claimed gases as taught by Ong et al. since these are known gases used to form a DLC thin film and a SiC thin film.

Response to Arguments

10. Applicant's arguments filed November 7, 2003 have been fully considered but they are not persuasive.

Applicant has argued that Hijikata fails to teach a plasma electrode being of a truncated dome shape. Merriam-Webster's Collegiate Dictionary tenth edition defines "truncated" as simply having an apex replaced by a plane. Furthermore, the apex of plasma electrode 206a of Hijikata is replaced by hole in a plane. Thus as broadly claimed, the plasma electrode of Hijikata has a truncated dome shape.

Applicant has argued that Kim does not teach a truncated dome shape electrode, but just a regular dome without any opening on top thereof. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant has argued that Collins does not teach a truncated dome shape electrode. Merriam-Webster's Collegiate Dictionary tenth edition defines "truncated" as simply having an apex replaced by a plane. Furthermore, the apex of plasma electrode 1020 of Collins is replaced by hole in a plane. Thus as broadly claimed, the plasma electrode of Kim et al. in view of Collins et al. has a truncated dome shape.

Applicant has argued that Hijikata merely shows a tubular electrode, in which the diameter of the electrode is the same from the top and bottom thereof. However, as seen in Figure 4, the diameter of the truncated dome shape electrode becomes smaller from the bottom of the electrode toward the top (see attached Fig. 4).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Crowell whose telephone number is (703) 305-1956. The examiner can normally be reached on M-F (8:00 - 4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone numbers for the

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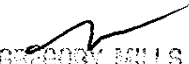
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organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

AMC *ame*
November 17, 2003


GREGORY MILLS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700